

C L A I M S

1. An examination assistant device used for examination in which a process solution comprising an etching solution is held in contact with an examination objective portion of a quartz pole member of a semiconductor processing apparatus, and then the process solution is analyzed to identify a metal impurity contained in the examination objective portion, wherein the pole member includes a pair of concave portions disposed one on either side of the examination objective portion, the device comprising:

a pair of end plates configured to engage with the pair of concave portions;

a frame connecting the pair of end plates; and

a solution receiver disposed between the pair of end plates, and having dimensions to store the process solution and hold the process solution in contact with the examination objective portion.

2. The device according to claim 1, further comprising a pair of latches to attach the device to the pole member, such that the pole member is pinched between the pair of latches and the pair of end plates.

3. The device according to claim 2, wherein each of the latches is pivotally supported on the frame and rotatable between a position to attach the device to the pole member and a position to detach the device from the pole member.

4. The device according to claim 1, wherein the device is attached to the pole member by close-contact engagement of the pair of end plates with the pair of concave portions.

5 5. The device according to claim 1, wherein the pole member comprises a plurality of grooves for supporting target substrates to be processed in the semiconductor processing apparatus, and the pair of concave portions are two of the grooves.

10 6. The device according to claim 5, further comprising, in addition to the pair of end plates, a plurality of engaging plates to be inserted into the grooves, wherein the device is attached to the pole member by close-contact engagement of the pair of end
15 plates and the engaging plates with the grooves.

7. The device according to claim 1, wherein the solution receiver is defined by a space in a container formed by the pair of end plates and the frame.

8. The device according to claim 7, wherein the
20 pair of end plates and the frame consist essentially of fluoroplastic.

9. An examination assistant device used for examination in which a process solution comprising an etching solution is held in contact with an examination
25 objective portion of a quartz reaction tube of a semiconductor processing apparatus, and then the process solution is analyzed to identify a metal

impurity contained in the examination objective portion, wherein the quartz reaction tube includes a curved surface on which the examination objective portion is positioned, the device comprising:

5 an annular member having a bottom surface to come into close contact the curved surface, and configured to cooperate with the curved surface to form a solution receiver that surrounds the examination objective portion for storing the process solution.

10 10. The device according to claim 9, wherein the annular member consists essentially of fluoroplastic.

11. The device according to claim 9, wherein the annular member further comprising an elastic seal member disposed on the bottom surface.

15 12. The device according to claim 9, wherein the annular member further comprising a magnet embedded therein.

13. An examination method for identifying a metal impurity contained in an examination objective portion of a quartz product of a semiconductor processing apparatus, the method comprising:

20 placing on the quartz product an examination assistant device configured to form a solution receiver to hold a liquid in contact with the examination objective portion;

25 causing a process solution comprising an etching solution within the solution receiver to be in contact

with the examination objective portion for a predetermined time, thereby performing etching on the examination objective portion; and

operating an analyzer to analyze the process
5 solution used for the etching, thereby identifying the metal impurity contained in the examination objective portion.

14. The method according to claim 13, wherein said identifying the metal impurity contained in the
10 examination objective portion comprises:

evaporating and drying the process solution used for the etching to precipitate quartz and the metal impurity, thereby forming a precipitated product;

dissolving the precipitated product into a
15 secondary process solution comprising an etching solution and set to be in an amount smaller than that of the process solution; and

operating the analyzer to analyze the secondary process solution containing the precipitated product
20 dissolved therein.

15. The method according to claim 13, wherein said identifying the metal impurity contained in the examination objective portion comprises:

condensing the process solution used for the
25 etching to form a condensed solution; and

operating the analyzer to analyze the condensed solution.

16. The method according to claim 13, wherein said identifying the metal impurity contained in the examination objective portion is performed by an inductively coupled plasma mass analyzer.

5 17. The method according to claim 13, wherein the predetermined time for performing the etching on the examination objective portion is determined to correspond to a target etching depth, with reference to a relationship prepared in advance between process time
10 and quartz etching amount in etching quartz by the etching solution.

18. The method according to claim 13, wherein said identifying the metal impurity contained in the examination objective portion comprises:

15 analyzing the process solution used for the etching to detect an amount of quartz and an amount of the metal impurity; and

 using the amount of quartz and the amount of the metal impurity to estimate a concentration of the metal
20 impurity in the examination objective portion.

19. The method according to claim 13, wherein the quartz product is a pole member comprising a plurality of grooves for supporting target substrates to be processed in the semiconductor processing apparatus,
25 and the pole member includes a pair of concave portions disposed one on either side of the examination objective portion, and

wherein the examination assistant device comprises a pair of end plates configured to engage with the pair of concave portions, a frame connecting the pair of end plates, and a solution receiver disposed between the pair of end plates, and having dimensions to store the process solution and hold the process solution in contact with the examination objective portion.

20. The method according to claim 13, wherein the quartz product is a quartz reaction tube of a semiconductor processing apparatus, and the quartz reaction tube includes a curved surface on which the examination objective portion is positioned, and

wherein the examination assistant device comprises an annular member having a bottom surface to come into close contact the curved surface, and configured to cooperate with the curved surface to form the solution receiver that surrounds the examination objective portion for storing the process solution.